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54 A relational data retrieval apparatus.

57 A relational data retrieval apparatus which comprises a data-inputting unit, a data-storing unit for storing the input data, a data retrieval-controlling unit, a relational data extraction-controlling unit and a display unit. The apparatus can extract automatically all required relational data completely on its first retrieval.

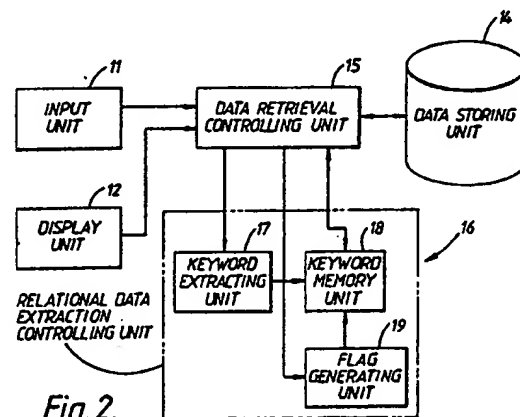


Fig. 2.

## A RELATIONAL DATA RETRIEVAL APPARATUS

### BACKGROUND OF THE INVENTION

#### Field of the Invention:

This invention relates to a data retrieval apparatus using a data base that stores various data, and more particularly to a relational data retrieval apparatus that can output not only data corresponding to designated keywords, but also other relational data related to such data.

#### Description of the Prior Art:

A data retrieval apparatus, which can obtain necessary data using a data base that stores various data, has been widely applied. In such an apparatus, an essential word normally is selected as a keyword from words that constitute a datum. This keyword is stored in a data base separate from other words. In some cases, not only a single keyword, but plural keywords may also be given to a datum. Therefore, when such a single keyword is designated, a datum corresponding to the designated keyword can be output. On the other hand, when a combination of plural keywords is designated, a datum, which satisfies the condition in which plural designated keywords are combined, can be output.

In recent years, a portable data base used for storing memoranda, such as personal information data and the like, has been developed. Such a portable data base is generally called an electronic pocket-sized notebook. In the data base of this type, various non-uniform data are input in fragments one after another.

For example, a first datum has a content which, for example, represents "Mr. A works for the company X." In this case, "A" and "X" are defined as keywords of the first datum. The keywords "A" and "X" are respectively stored in a data base. A second datum has a content which, for example, represents "The phone number of the company X is MMM-NNNN." In this case, "X" is defined as a keyword of the second datum. The keyword "X" is stored in the same data base.

Now assume that the user of this apparatus requires information on "the phone number of Mr. A." If the keyword "A" is used to retrieve such information from the data base, only the content of the first datum, i.e., "Mr. A works for the company X" is displayed. Namely, the required information cannot be immediately obtained. Here, observing

the display, the user recognizes that the first datum has the keyword "X" besides the keyword "A". Then, the user executes data retrieval using the keyword "X". As a result, the content of the second datum, i.e., "The phone number of the company X is MMM-NNNN", is displayed. As described above, the user cannot directly obtain in one step the necessary information on "the phone number of Mr. A. This means that the user must execute data retrieval twice. Specifically, in order to retrieve "the phone number of Mr. A", the user must execute a second retrieval using the first retrieval result. Therefore, the apparatus of this type cannot retrieve all the required data on its first retrieval. Namely, the procedures of data retrieval must be frequently repeated after checking previous retrieval results. Thus, it is difficult to extract all the relational data completely.

In the case of a relational data base, i.e., when data are stored in tabulated form, relational data can be retrieved relatively easily. However, in this case, both itemizing relational data and inputting such data require cumbersome and time-consuming procedures.

As described above, in the conventional data retrieval apparatus, it is substantially impossible to extract all the relational data in one step using only a single keyword. If an attempt is made to retrieve all the relational data, cumbersome and time-consuming operations must be performed.

### SUMMARY OF THE INVENTION

Accordingly, one object of the present invention is to provide a relational data retrieval apparatus. The apparatus can naturally retrieve data on the basis of designated keywords. In addition, the apparatus can broadly retrieve even relational data including no designated keywords. Moreover, the apparatus can extract all the required relational data completely on its first retrieval.

Briefly in accordance with one aspect of the present invention, there is provided a relational data retrieval apparatus which comprises an input unit, a data retrieval-controlling unit, a data-storing unit, a relational data extraction-controlling unit and a display unit.

### BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention

and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIGURE 1 is a perspective view illustrating an external appearance of one embodiment according to the present invention;

FIGURE 2 is a block diagram illustrating a configuration of one embodiment according to the present invention;

FIGURE 3a is a diagram illustrating a configuration of a data base stored in the data-storing unit of FIGURE 2;

FIGURE 3b is a diagram illustrating the changes in flag-adding within the flag memory of FIGURE 2; and

FIGURE 4 is a flow chart illustrating the operations of one embodiment according to the present invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, wherein like reference numerals designate identical or corresponding parts throughout the several views, and more particularly to FIGURE 1 thereof, one embodiment of this invention will be described.

FIGURE 1 shows an external appearance of a relational data retrieval apparatus of one embodiment according to the present invention. The apparatus is generally called an electronic notebook, which is pocket-sized and convenient for portable use. The apparatus can be opened and closed in the direction of the arrow 13. Specifically, when not in use, the apparatus can be folded into a box-like form convenient for carrying. When in use, the apparatus can be opened, as shown in FIGURE 1.

An input unit 11 comprises a plurality of keyswitches. The keyswitches include a keyword-locating keyswitch and a keyword-registering keyswitch. However, the input unit 11 may also be comprised of other input devices such as a handwriting recognition device. A display unit 12 comprises an LCD (liquid crystal display). However, the display unit 12 may also be comprised of other light-emitting elements. Further, electronic components such as semiconductor integrated circuits and interconnecting wiring leads are incorporated in a casing 10. The input unit 11 is provided in the casing 10, and the display unit 12 is provided in a casing 9.

FIGURE 2 is a block diagram illustrating a configuration of a relational data retrieval apparatus

according to one embodiment of the present invention. The apparatus comprises an input unit 11, a data-storing unit 14, a data retrieval-controlling unit 15, a relational data extraction-controlling unit 16 and a display unit 12.

The input unit 11 inputs data and keywords associated therewith. Further, the unit 11 inputs commands for designating keywords of data to be retrieved, and for executing such retrieval. The data-storing unit 14 is a data base that stores the data input by means of the input unit 11. The unit 14 stores such data on the basis of keywords.

The registration of keywords is performed as follows. Specifically, the particular words to be registered as keywords are selected from the words that constitute the input data. Such word selection is achieved by moving a contrasting display to the particular words by use of the keyword-locating keyswitch. Thereafter, the keyword-registering keyswitch is depressed. Other displays, such as a cursor or a flashing character may also be used. The data-storing unit 14 comprises a semiconductor memory device, a magnetic disk recording device or the like.

The data retrieval-controlling unit 15 retrieves data from the data-storing unit 14. Such data are designated on the basis of Keywords which are supplied from the relational data extraction-controlling unit 16. Further, the unit 15 executes procedures for adding flags to such data.

The relational data extraction-controlling unit 16 supplies the data retrieval-controlling unit 15 with keywords as follows. Specifically, keywords are input by the input unit 11, and relational keywords are extracted from the data which have been retrieved by the unit 15. As a result, the relational data extraction-controlling unit 16 can control the extent of data retrieval. The unit 16 comprises a keyword-extracting unit 17, a keyword memory 18 and a flag memory 19. The keyword memory 18 stores keywords extracted by the keyword-extracting unit 17. The display unit 12 displays the data retrieved by the data retrieval-controlling unit 15.

Next, the operations of the above-described data retrieval apparatus of this embodiment according to the present invention will be described with reference to FIGURES 3a and 3b, and FIGURE 4.

FIGURE 3a shows the relationship between keywords and data stored in the data-storing unit 14. In FIGURE 3a, a datum "a" and a datum "b" are data, each of which was input at different instants as a fragment of information. The content of the datum "a" represents, for example, that "Mr. A works for the company X.", and the keywords thereof are "A" and "X". The content of the datum "b" represents that "The phone number of the company X is MMM-NNNN.", and the keyword thereof is X. FIGURE 3b shows the changes in

flag-adding within the flag memory 19. In FIGURE 3b, the states of flag will change with time as shown in the direction of the arrows. Here, retrieval operations in the case when the user inputs the keyword A to obtain the phone number of Mr. A will be described.

FIGURE 4 is a flow chart illustrating the operations of the above-described data retrieval apparatus. First, the keyword "A" is input (Step 1). The thus input keyword "A" is fed through the data retrieval-controlling unit 15 into the keyword memory 18 of the relational data extraction-controlling unit 16 (Step 2). Next, the unit 15 initializes all the flags, which have been added to respective data stored in the data-storing unit 14, into a "0" state (Step 3). Specifically, FIGURE 3b shows the content of the flag memory 19 of FIGURE 2. In FIGURE 3b, when a datum including a keyword is extracted from the data-storing unit 14, the state of the flag associated with the thus extracted datum is changed from "0" to "1". Namely, the state "1" of the flag represents that the corresponding datum has been extracted on the basis of a certain keyword. Therefore, in Step 3, when all the flags are changed from "1" to "0", i.e., when the content of the flag memory 19 is reset to "0", the preparation for the subsequent retrieval procedures is completed. Next, the data retrieval-controlling unit 15 retrieves the datum "a" of FIGURE 3a having the keyword "A" which has been stored in the keyword memory 18 (Step 4).

After the retrieval of the datum "a", the flag is changed from "0" to "1" in response to the datum "a" (Step 5). This change of the flag is executed by writing "1" into a portion corresponding to the datum "a", as shown in FIGURE 3b. Thereafter, keywords associated with the datum "a" are extracted by the keyword-extracting unit 17. The unit 15 judges whether or not the thus extracted keywords include keywords other than the designated keyword "A" (Step 6).

In this case, the keyword X is included as the keyword of the datum "a" besides the keyword "A". Thus, the keywords "A" and "X" are stored in the keyword memory 18 (Step 7). The operations of Step 4 through Step 7 are continuously performed until all the data having the keyword "X" are extracted (Step 8). After the continuous retrieval of the keyword "X" in Step 8, the datum "b" of FIGURE 3a can be extracted. As a result, a flag in the flag memory 19, which corresponds to the datum "b" is changed from "0" to "1". As described above, the apparatus of this invention retrieves data on the basis of the keyword "A". As a result, the datum "a" is extracted. Thereafter, the apparatus examines whether or not the datum "a" includes any other keywords besides the keyword "A". In the above-described example, the appa-

tus detects the existence of the keyword "X". Next, the apparatus retrieves data on the basis of the keyword "X", and obtains the datum "b". Each time the apparatus obtains the datum "a" or the datum "b" on the basis of the keyword "A" or the keyword "X", the apparatus changes the flags, each corresponding to each datum from "0" to "1". This allows the apparatus to distinguish the data to be output from other data. After the completion of the prescribed data retrieval, the display unit 12 displays the data "a" and "b" to which flags are added as the result of retrieval (Step 9).

In the above-described operations, the datum "b" which does not have the keyword "A" can be automatically retrieved. Specifically, by designating only the keyword "A", the datum "b" can be retrieved as one of the relational data of the datum "a". As a result, the phone number of Mr. A can be obtained.

In the above described embodiment, the retrieval operations of relational data are performed twice. Specifically, the second retrieval is performed on the basis of the keyword "X" included in the datum "a" which has been extracted by the first retrieval. However, this invention is not limited to this, but the retrieval operations of relational data may also be performed three times or more, if required. For example, the third retrieval can be performed on the basis of a keyword other than the keyword "X" included in the datum "b" which has been extracted by the second retrieval. This can cause the relaxation of a condition in which retrieval operations are ended. As a result, relational data can be extracted from a wider range of information.

To the contrary, when such a condition is determined to be more strict, the relational keywords are extracted only from the data in which all the plural designated keywords are included. Further, in the strict condition, the data, which include the extracted relational data as representative keywords, are retrieved. Moreover, the data, which include only the corresponding relational keywords as keywords, are retrieved.

Further, in this embodiment, flags are added correspondingly to the retrieved data. However, pointers (address information), which correspond to data to be retrieved, may also be stored. This allows that when the retrieved data are output, all the data are not required to be processed. As a result, higher processing speed of the data retrieval apparatus can be achieved.

Moreover, the present invention can be applied to an apparatus in which prescribed keywords have been stored corresponding to particular data. In addition, the present invention can also be applied to a data base in which prescribed keywords are automatically extracted.

As described above, in the apparatus of this invention, the prescribed retrieval operations can be performed on the basis of not only the designated keywords, but also the relational keywords. This means that even when such relational keywords are not actually designated, the relational data can be widely retrieved. As a result, all the required data can be extracted completely without an increase in user's burden. Therefore, in the apparatus of this invention, the required retrieval operations can be performed easily and efficiently.

Obviously, numerous additional modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described herein.

### Claims

1. A relational data retrieval apparatus for storing and retrieving data arranged in a plurality of groups, at least one of the groups being a relational group having a prescribed relationship to another group, comprising:  
means for inputting the data to the apparatus;  
means for storing the input data;  
means for selecting and storing at least one keyword from each group, each keyword corresponding to a part of the group for identifying the group, the relational group including at least two keywords, one of the keyword corresponding to the other related group;  
means for retrieving a group from said storing means corresponding to a specific keyword input to said inputting means; and  
relational keyword means automatically for extracting the keyword from the retrieved group corresponding to the other related group when the retrieved group is a relational group, and retrieving the related group from said storing means corresponding to the extracted keyword.

2. The apparatus of claim 1, further including means for displaying the retrieved groups.

3. The apparatus of claim 1, wherein said means for inputting data includes a plurality of keyswitches.

4. The apparatus of claim 1, wherein said means for inputting data includes a handwriting recognition device.

5. The apparatus of claim 2, wherein said display means includes a liquid crystal displaying device.

6. The apparatus of claim 1, wherein said means for inputting data includes means for registering keywords.

7. The apparatus of claim 6, wherein said means for registering keywords includes contrast means for distinguishing keywords within a displayed group.

8. The apparatus of claim 1, wherein said means for storing the input data includes a semiconductor memory device.

9. The apparatus of claim 1, wherein said means for storing the input data includes a magnetic disk device.

10. The apparatus of claim 1, wherein said selecting and storing means includes flag memory means for storing a flag indicating the retrieval of data corresponding to a specific keyword.

11. A relational data retrieval apparatus comprising:

means for inputting data;

means for storing the input data;

means for designating keywords from words of the input data;

keyword storing means for storing keywords;

means for retrieving a corresponding first datum on the basis of a first keyword;

relational keyword extracting means for extracting a second keyword from words of the first datum;

relational data retrieving means for a corresponding second datum on the basis of the second keyword; and

means for displaying the first and second data.

12. The apparatus of claim 11, wherein said means for inputting data includes a plurality of keyswitches.

13. The apparatus of claim 11, wherein said display means includes a liquid crystal displaying device.

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Not a priority document  
No priority claim

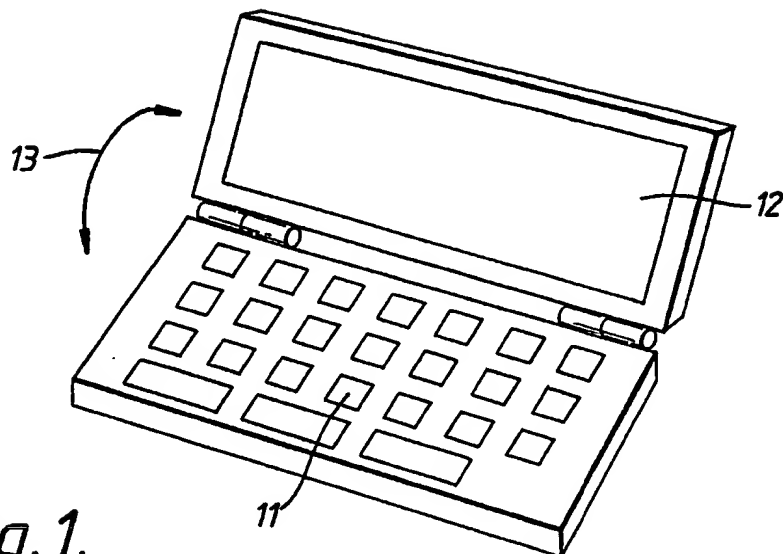


Fig. 1.

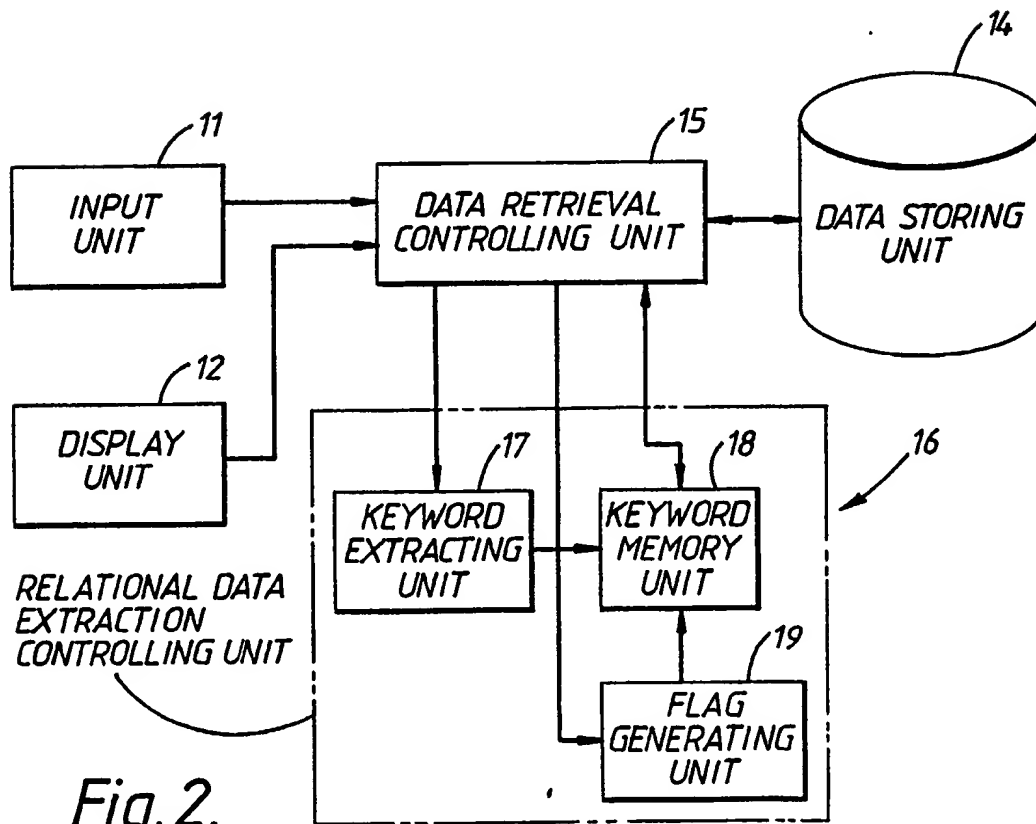


Fig. 2.

Not to be used for  
any other purpose

00000000

DATA "a"

KEYWORD	DATA
~	~
A , X	MR A WORKS FOR THE COMPANY X.
~	~
X	PHONE NUMBER OF THE COMPANY X IS MMM-NNNN
~	~

DATA "b"

Fig.3a

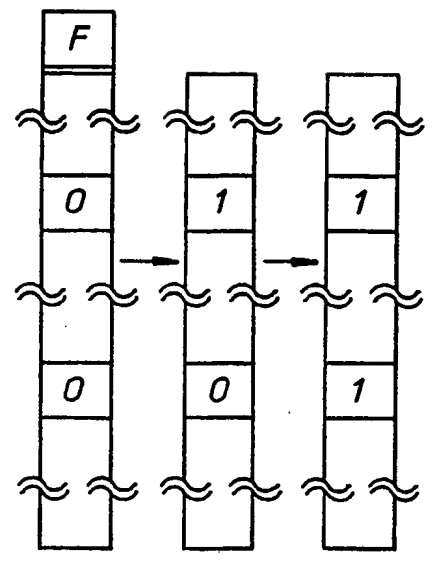


Fig.3b

Not classifiable  
Not classifiable

EP 0 343 918 A2

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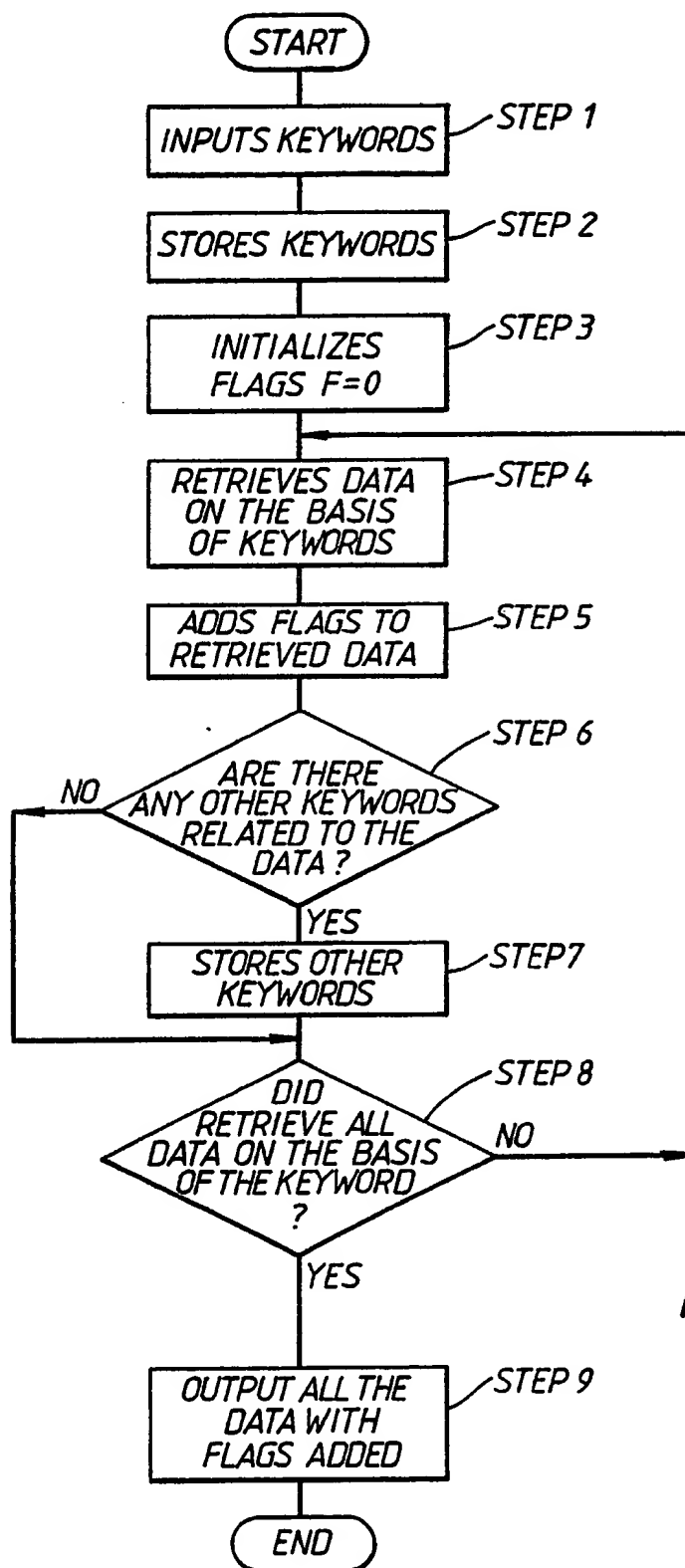


Fig. 4.